TRANSPOWER

Annual Outage Planning Forum 26/27

18 March 2026

Opening **Karakia**

Kia tau te rangimarie
O te Rangi e tū iho nei
O Papatūānuku e takoto nei
O te taiao e awhi nei
Ki runga i a tātou
Tihei Mauri ora

Translation

Let the peace
of the sky above us
of the earth laid out here
and of the all-embracing universe
settle upon us
Breathe the breath of life

Agenda

Annual Outage Plan – Our Journey	David Katz Dave Brown	Head of Operations Planning Outage Planner
Key Outages and Projects 2026/2027	Gayatri Kanduri	Works Planner
HVDC Outages	Steve Butler	Service Performance Manager
Wairakei Ring Outages Campaign Management	Dylan Crighton	Programme Manager
Outage Notifications and Representations	Dave Brown	Outage Planner
Grid Owner Customer Portal for Outage Notifications	Pravin Jannoo	Outage Planner
Outage Planning Policy Outage Assessments	Mark Gilchrist	System Security Manager
System views in POCP	Minura Vithanage	Planning & Project Support Manager
Managing lower South Island low hydrology	Mark Gilchrist	System Security Manager
Close	David Katz	Operations Planning Manager

Annual Outage Plan – Our Journey

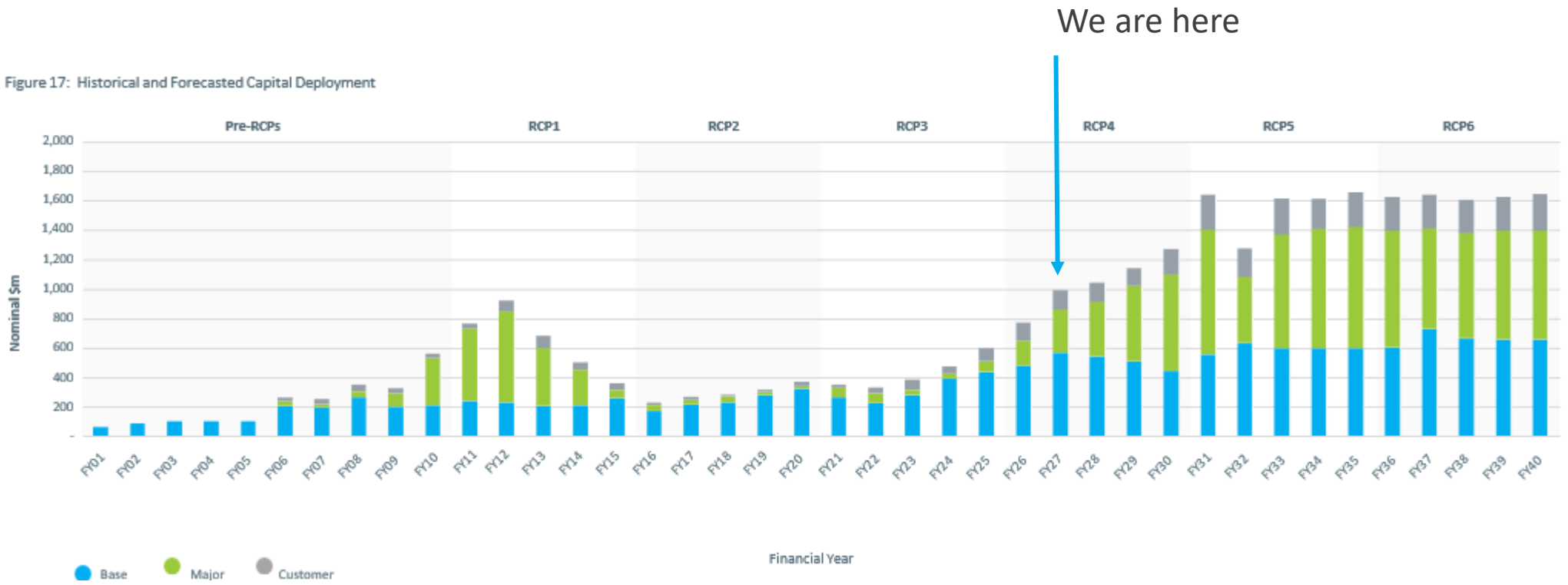
David Katz

Head of Operations Planning

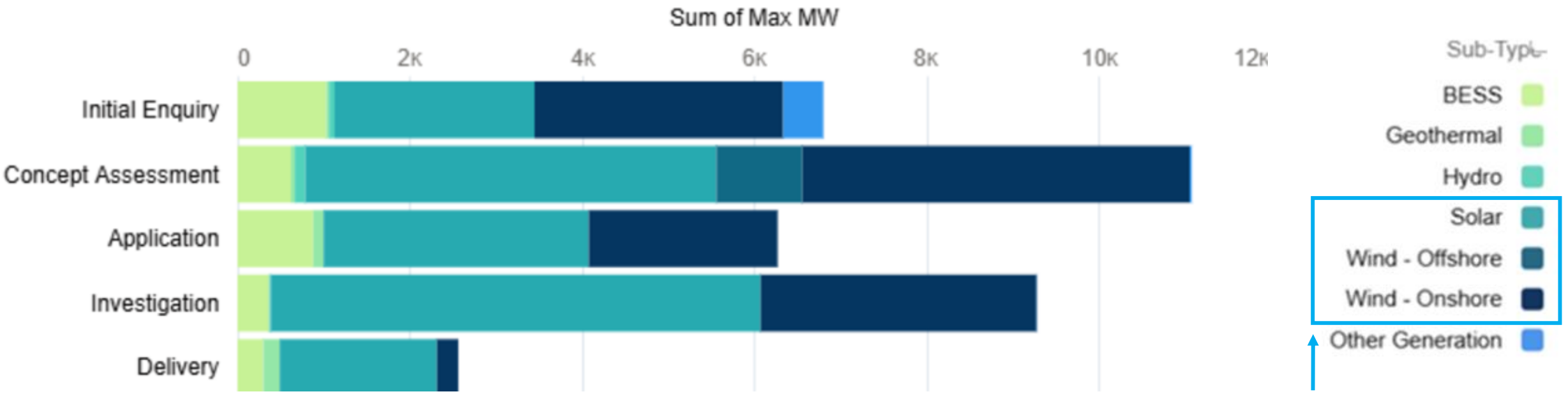
Dave Brown

Outage Planner

Our challenge – more demand for outages



Our challenge – less certain planning environment



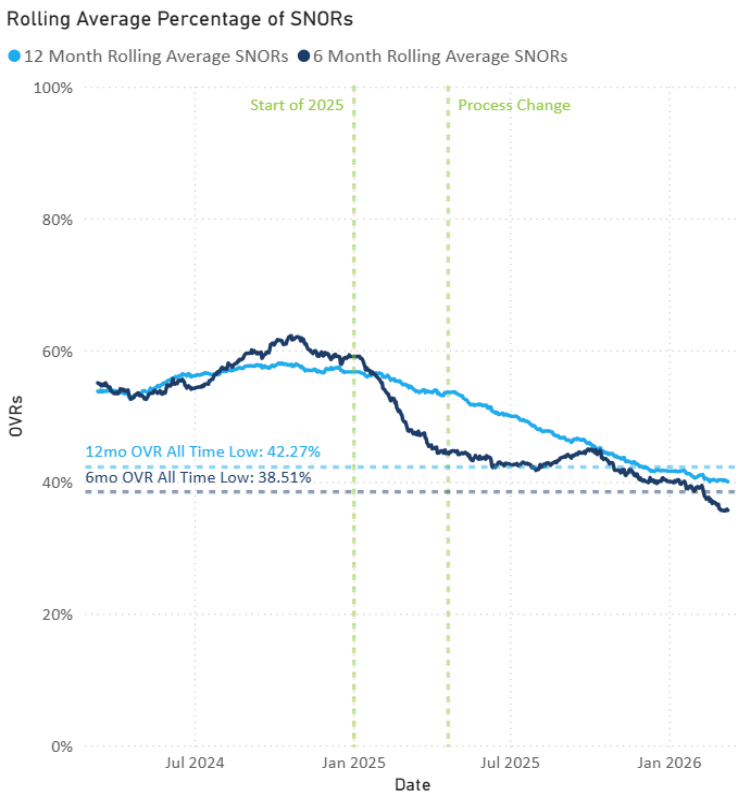
The pipeline is mostly intermittent

Our challenge: More demand for outages in a less certain planning environment

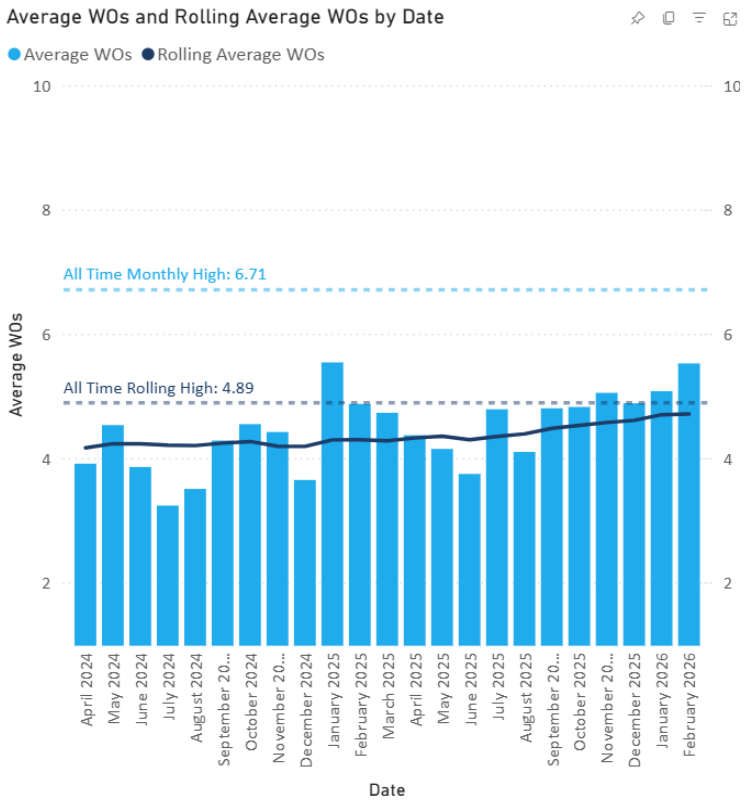
Our journey to meeting this challenge

- Accepted: Every outage introduces cost and risk
- Recognized: Our strategy to do the work cannot simply demand double the number of outages.
- Revised: our process across Transpower to refocus on doing as much work as possible per outage.
- Key process focuses
  - Planning with longer lead times
  - Bundling work at every opportunity
  - Plan Wairakei Ring outages as a campaign

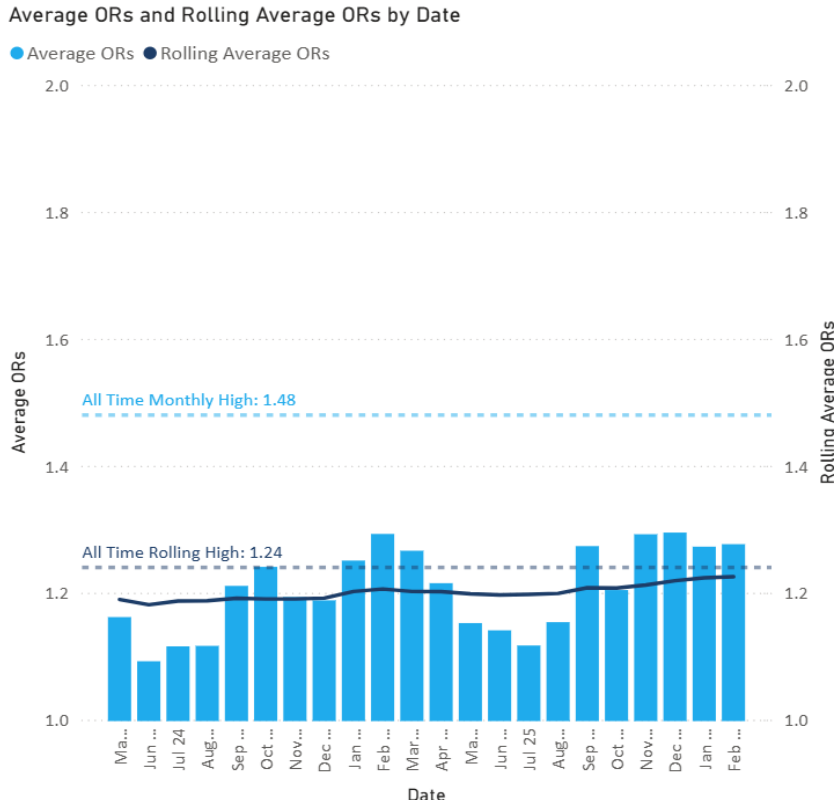
Results so far...



Planning with longer lead times, enabling optimization to happen, risks to be mitigated, and market to adjusts.



We are doing more work per outage every time a crew show up.



More outages are being shared between crews, and service providers.

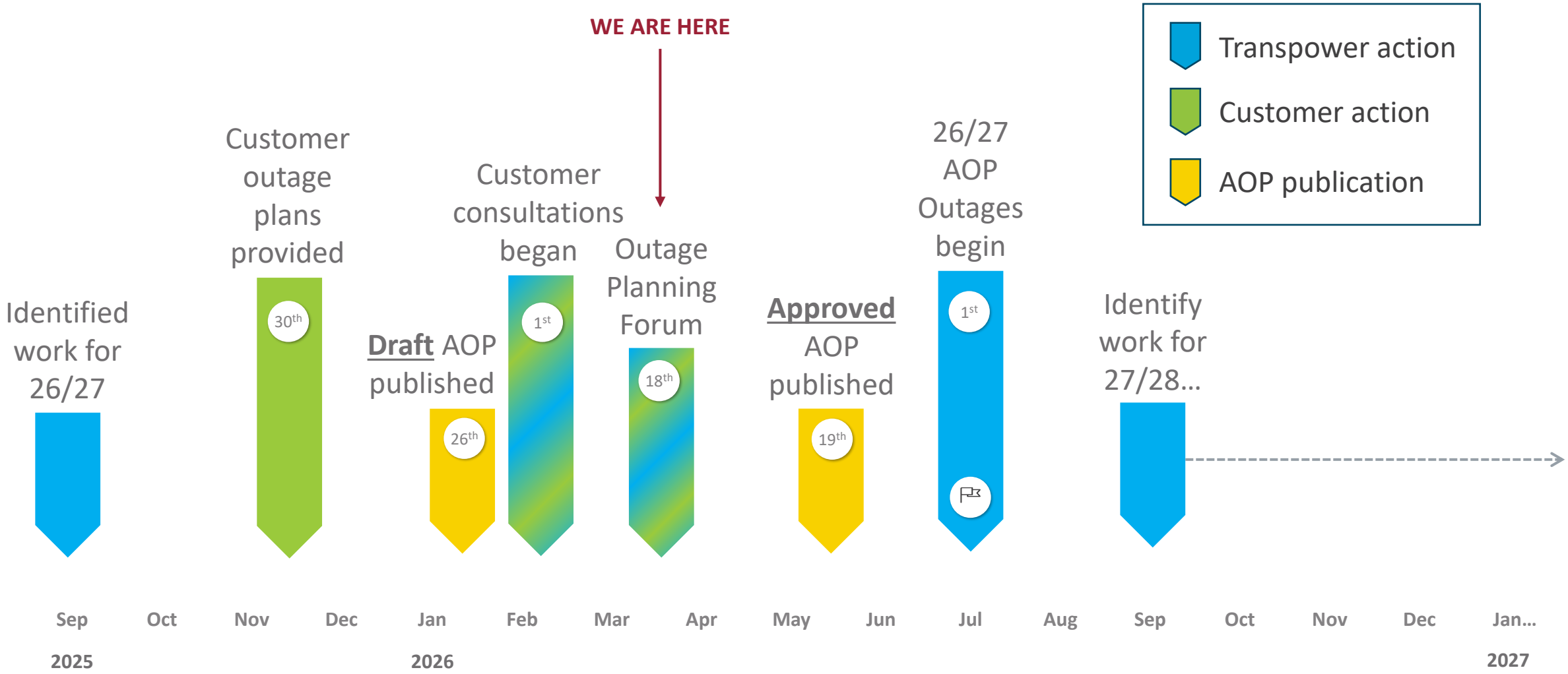
Next Steps – Outage optimization tool support to enable more work outage

- Starting the journey to procure an outage optimization tool
  - Market scan is complete, we have identified possible vendors
  - Begin a Proof of Concept, then funding reserved for possible implementation
- This will make developing outage plans more efficient enabling more time to be spent on the hard to plan

Next Steps – Engineering study tool support less predictable planning environment

- Investigate tooling that runs 30+ power flow studies, and identifies risks
  - Investigation about to start
  - Possible vendors available, but no clear off the shelf tooling
  - This will enable much deeper understanding of outage risk due to variations in intermittent generation.
  - Strong synergies with control room use cases

2026/27 Annual Outage Plan – Key Dates



Key Outages and Projects for 2026/2027

Gayatri Kanduri

Works Planner

Significant Project-related work In 26/27

HVDC planned maintenance

- HVDC **Pole and Bi-pole scheduled maintenance Outages (Jan–Feb 2027) NI & SI** are operationally significant.

These outages constrain system availability and act as hard boundaries for bundling other work.

Substation Circuit Breakers (CB) / Reactive power filters/ protection programmes

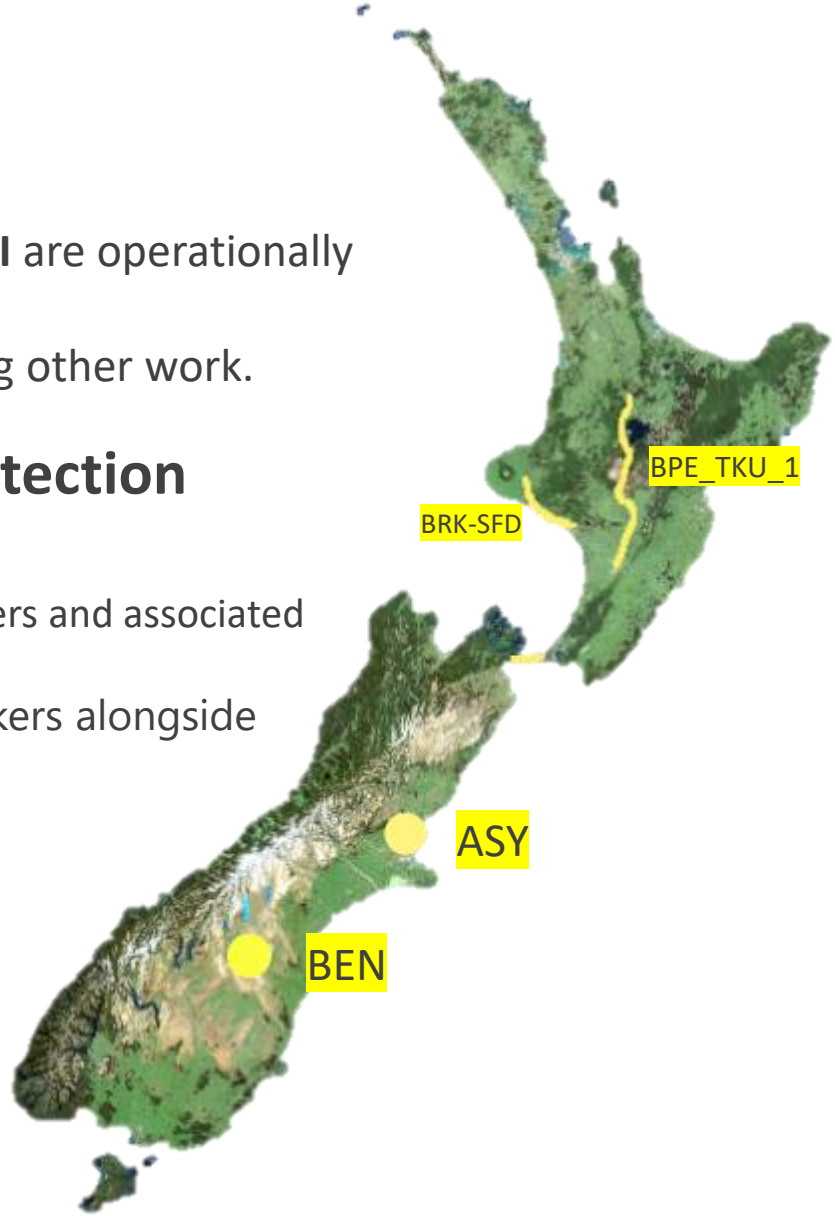
- BEN 220BZ CB & filter migrations (Replacement or migration of high-voltage circuit breakers and associated reactive power filtering equipment)
- ASY 66 kV CB replacement + pole refurbishment (Renewal of ageing 66 kV circuit breakers alongside associated structural or pole works)
- Protection / SPS projects (e.g. SPS-linked outages)

These typically span multiple outage windows.

Line programme with campaign-style outages

- BPE_TKU_1 (long line outage window Mar–May 2027)
- BRK–SFD tower steel replacement / painting campaigns

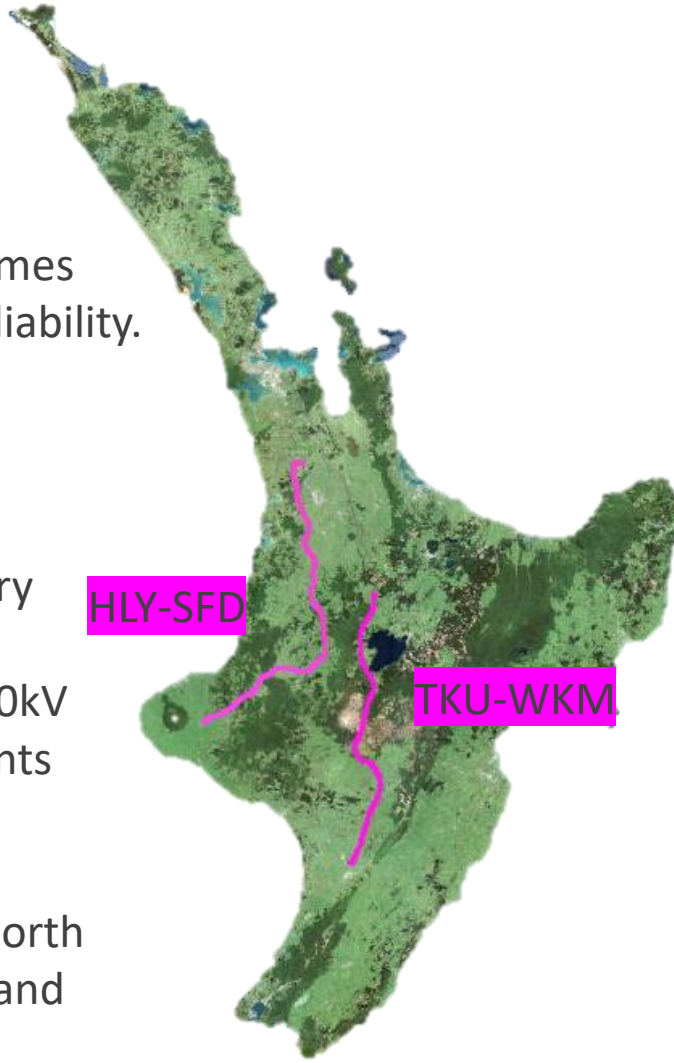
These are high-impact due to duration and limited seasonal flexibility.



Growth from Customer Enquiries & New Connections

- Customer connection enquiries have exceeded forecast for the past two years
- New enquiry inflow stays strong through, particularly:
  1. Generation (solar, wind, Battery Energy Storage System -BESS)
  2. Electrification

The growing level of activity does mean that planning and coordination of outages becomes increasingly important to support these future connections while maintaining system reliability.



Net Zero Grid Pathways (NZGP) – Stage 1.1

- **Lines - TKU–WKM Duplexing (NZGP Stage 1.1)** Scheduled outage window from January 11, 2027, to May 14, 2027. This is a prolonged, campaign-style line outage.
- **Subs – various enabling works** include upgrades such as HLY–SFD protection, ONG 110kV split and autochangeover scheme, and TKU SPS, with primary equipment enhancements at TKU and WRK.
- These outages are classified as time-bound within POCP for 2026/27.
- **Outcomes: Central North Island (CNI) Investments** aim to increase transfer capacity north of Bunnythorpe by **60–90%,** supporting additional generation and electrification demand while ensuring system stability.

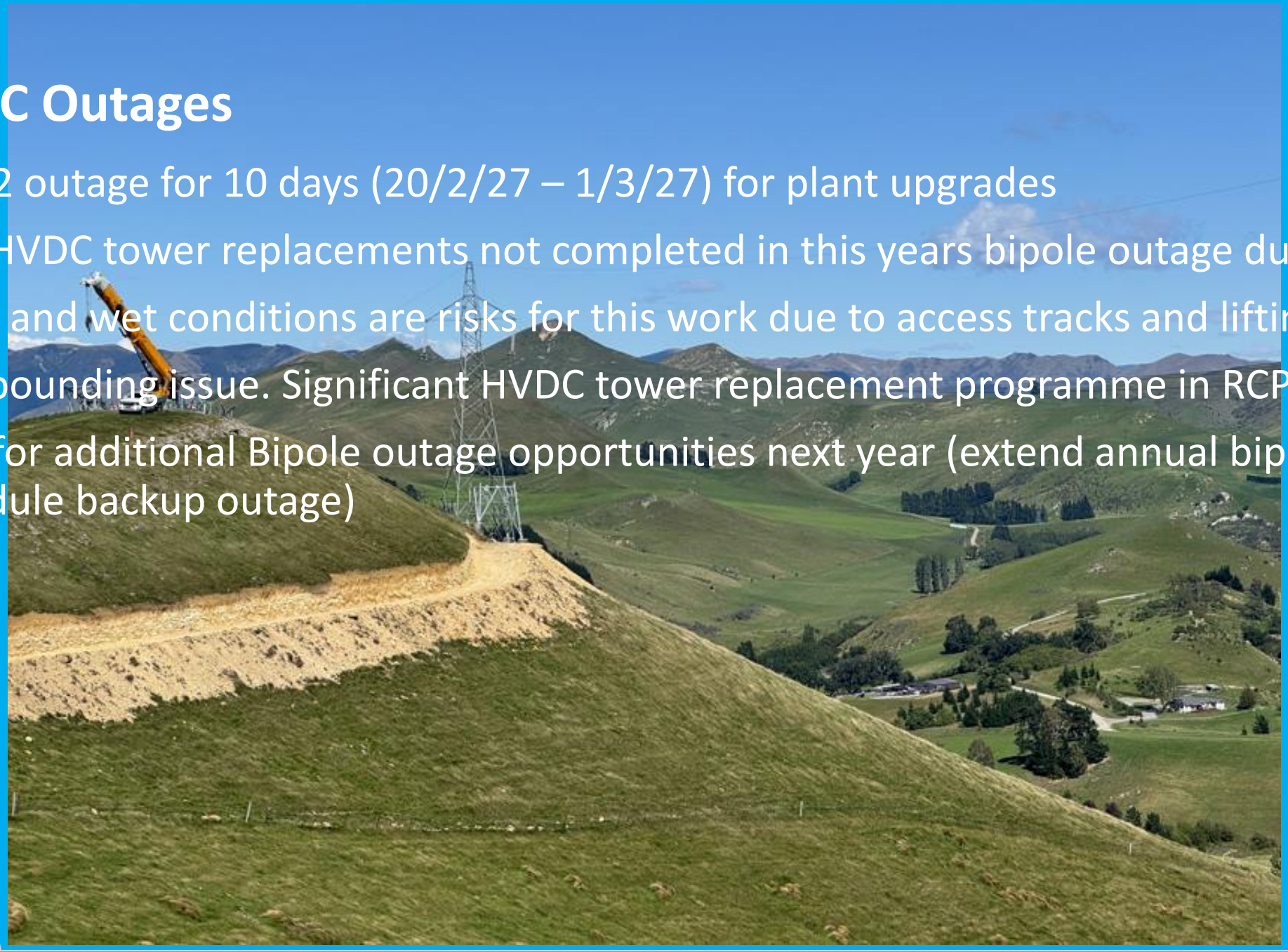
HVDC Outages

Steve Butler

Service Performance Manager – HVDC & PE

HVDC Outages

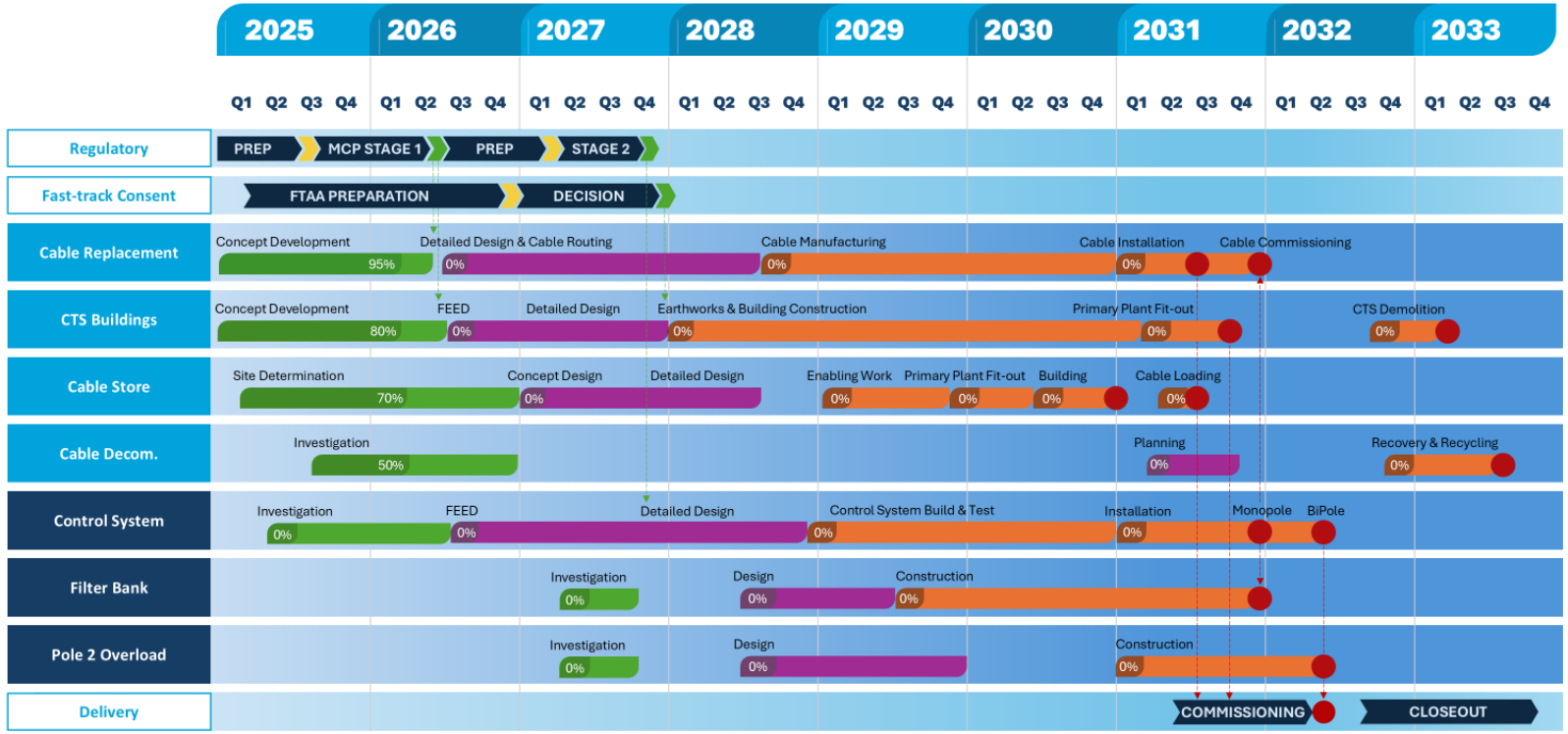
- Pole 2 outage for 10 days (20/2/27 – 1/3/27) for plant upgrades
- Two HVDC tower replacements not completed in this years bipole outage due to high winds.
- Wind and wet conditions are risks for this work due to access tracks and lifting operations
- Compounding issue. Significant HVDC tower replacement programme in RCP4
- Plan for additional Bipole outage opportunities next year (extend annual bipole outage and schedule backup outage)



TRANSPOWER

HVDC LINK UPGRADE PROGRAMME ROADMAP

Date	2-Mar-26
Revision	001



Streams

- Cables
- Controls

Phases

- Submission
- Outcome
- Major Deliverable
- Key Dependency
- Investigation
- Design
- Construction

Wairakei Ring Outages Campaign Management

Dylan Crighton

Programme Manager

Background

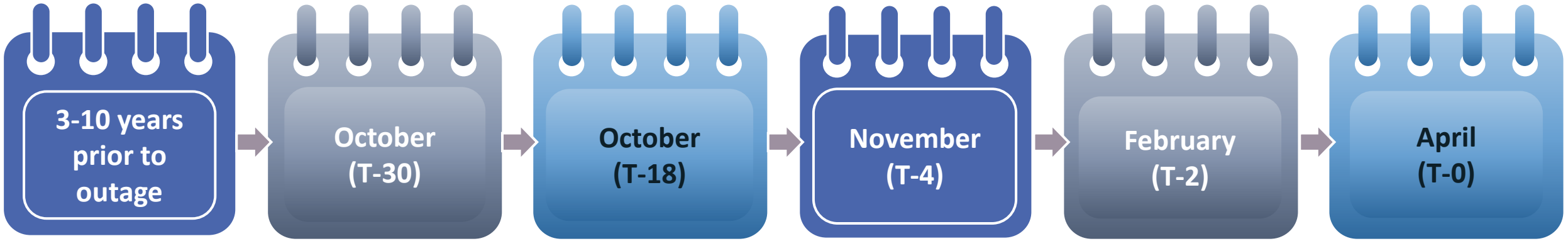
- THI_WKM_1, THI_WRK_1 and WKM_WRK_1 outages are difficult to manage due to large generation constraints.
- Campaign management is needed to improve Transpower's ability to confidently deliver this outages.
- Prior to NZGP upgrades, historic outages have averaged 1.8 days per circuit per year.

What's Campaign Management

- Plan work around the outages, not outages around the work
- Regular outage cadence over the same period each year, similar approach to HVDC outages
- Centralised coordination of Transpower's programme
- Governance group established to provide oversight and business support
- An additional level of outage timing and duration change control

Objective: Transpower and industry confident in outage period and able to schedule work with confidence.

WRK-WKM-C Outage Grid Planning Process (April Outages)



Long Term Outage Needs
Ongoing forecast of indicative outage requirements lodged

Investigation Projects Start
Any relevant investigation projects begin

Confirm Extended Outage Needs
Confirmed timing and duration of T + 18 months outages.

Confirmed Outage Need
For annual 2-day maintenance outages, confirm need or cancel

Final Work Plan
All work planned, contingency plans issued, outage confidence from System Operator

Annual Outage
Execution of outages

Any break-in work and subsequent outage extension outside of the above is subject to governance approval

**(T – X) where T is the outage month and X is the months prior to the outage*

Looking Forward

- We’re in a transition period and still planning 26/27 outages.
- Large outages in 26/27, up to 18 outage days across three circuits.
  - THI_WKM_1 – NZGP Whakamaru station upgrades, 8-days
  - THI_WRK_1 & WKM_WRK_1 – Wairakei maintenance, 5-days each circuit
- From 2028, outages on WRK-WKM-C planned 18-months in advance
- Confirm best annual outage period, have traditionally been held in late November early December
- Reviewing all months from September to April for 27/28 and beyond. Will be engaging with generators. There is no good month, there will be trade offs
- Outages will be planned annually but cancelled prior if not required
  - Firm maintenance outages needed every second year

WRK-WKM New Line

- Included in Net Zero Grid Pathways long list of project
- Now in early stages of investigation considering a new or replacement WRK-WKM line
- Public consultation is expected in 2027
- Possible build in second half of RCP5 (2033 to 2035)

Outage Notifications and Representations

Dave Brown

Outage Planner

Outage Notifications

- After the Annual Outage Plan is published in May, any changes to the plan will be communicated via notifications.

- You will receive notifications if you have registered an interest against a particular Outage Block (asset).
  - Let us know if there are any assets you want to register your interest for.

- Prior to the 19th May (publication of Approved AOP), you won't receive notifications for any changes – but all the outages can be viewed in **POCP**.
  - Filters can be set up in **POCP** to notify of any changes to the outages you are interested in.

- If Transpower does not receive correspondence from you to raise concerns over any outage(s), we assume that you agree to how Transpower has proposed them.

Customer Representations

- After a notification is sent, interested participants can request reconsideration of the timing and/or duration of the outage via a **representation** (within 7 business days of the notification being sent).

- Transpower will assess the representation and follow the process outlined in the EA's Outage Protocol.

- Interested participants are entitled to request a net benefit test if they consider the outage does not meet the net benefit principle.

- System Operator studies and their outcomes are taken into consideration when making changes to outages, to ensure system security.

- Transpower have an obligation to review outages based on changing environments, conditions or assumptions that have an impact on security and/or market.

Communicating with Transpower

North North Island (NNI)

Craig Woolf
Operations Planning
Senior Outage Planner

Demetrius Aati
Operations Planning
Outage Planner

Jordan Smith
Operations Planning
Operations Planning Engineer

NNI_Outage_Co-ordinators @transpower.co.nz

South North Island (SNI)

Mark Braithwaite
Operations Planning
Outage Planner

Callum Wadek
Operations Planning
Outage Planner

Kelly Dear
Operations Planning
Outage Planner

SNI_Outage_Co-ordinators @transpower.co.nz

South Island (SI)

Currently on OHMS project

Pravin Jannoo
Operations Planning
Outage Planner

David Brown
Operations Planning
Outage Planner

Tim Blackman
Operations Planning
Outage Planner

Cameron Mills
Operations Planning
Outage Planner

SI_Outage_Co-ordinators @transpower.co.nz

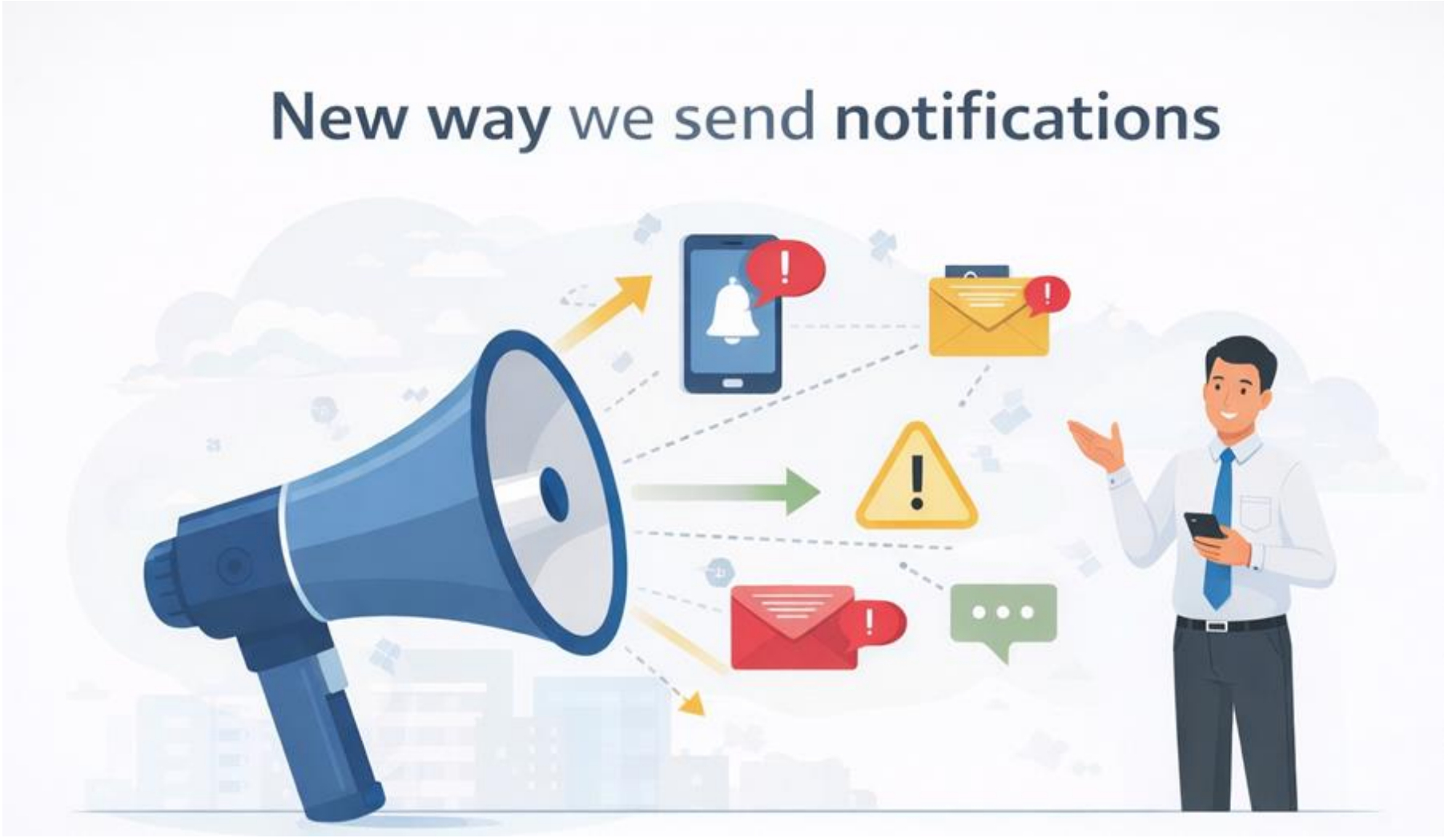
OutagePlanners@transpower.co.nz

Grid Owner Customer Portal for Outage Notifications

Pravin Jannoo

Outage Planner

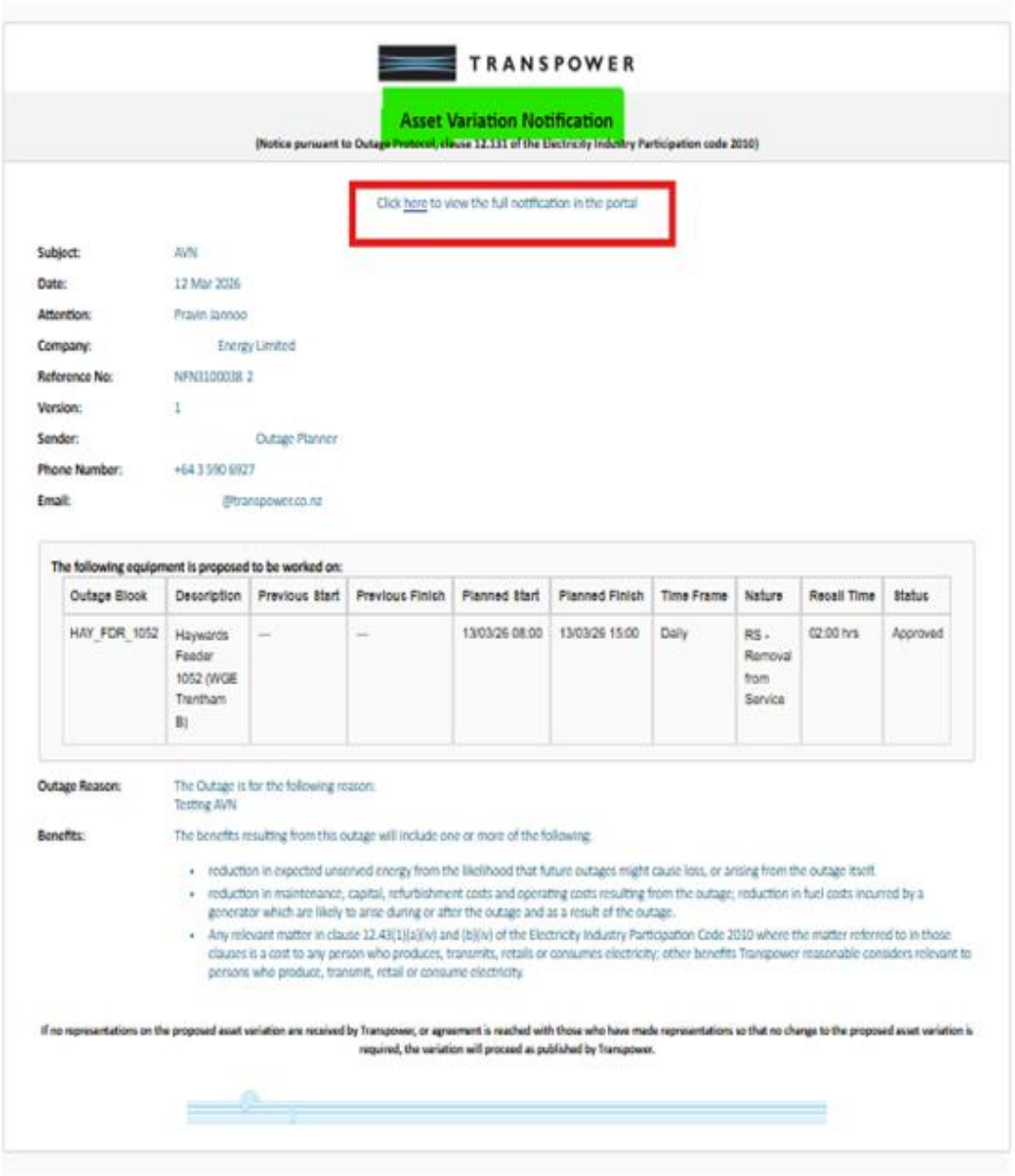
OHMS replacing IONS



31st March 2026

AVN

Changes will be included in the email body.



TRANSPOWER

Asset Variation Notification

(Notice pursuant to Outage Protocol, clause 12.131 of the Electricity Industry Participation code 2010)

Click here to view the full notification in the portal

Subject: AVN

Date: 12 Mar 2026

Attention: Pravin Jannoo

Company: Energy Limited

Reference No: NFN3100038 2

Version: 1

Sender: Outage Planner

Phone Number: +64 3 590 6927

Email: @transpower.co.nz

The following equipment is proposed to be worked on:

Outage Block	Description	Previous Start	Previous Finish	Planned Start	Planned Finish	Time Frame	Nature	Recall Time	Status
HAY_FDR_1052	Haywards Feeder 1052 (WGE Trentham B)	—	—	13/03/26 08:00	13/03/26 15:00	Daily	RS - Removal from Service	02:00 hrs	Approved

Outage Reason: The Outage is for the following reason:
Testing AVN

Benefits: The benefits resulting from this outage will include one or more of the following:

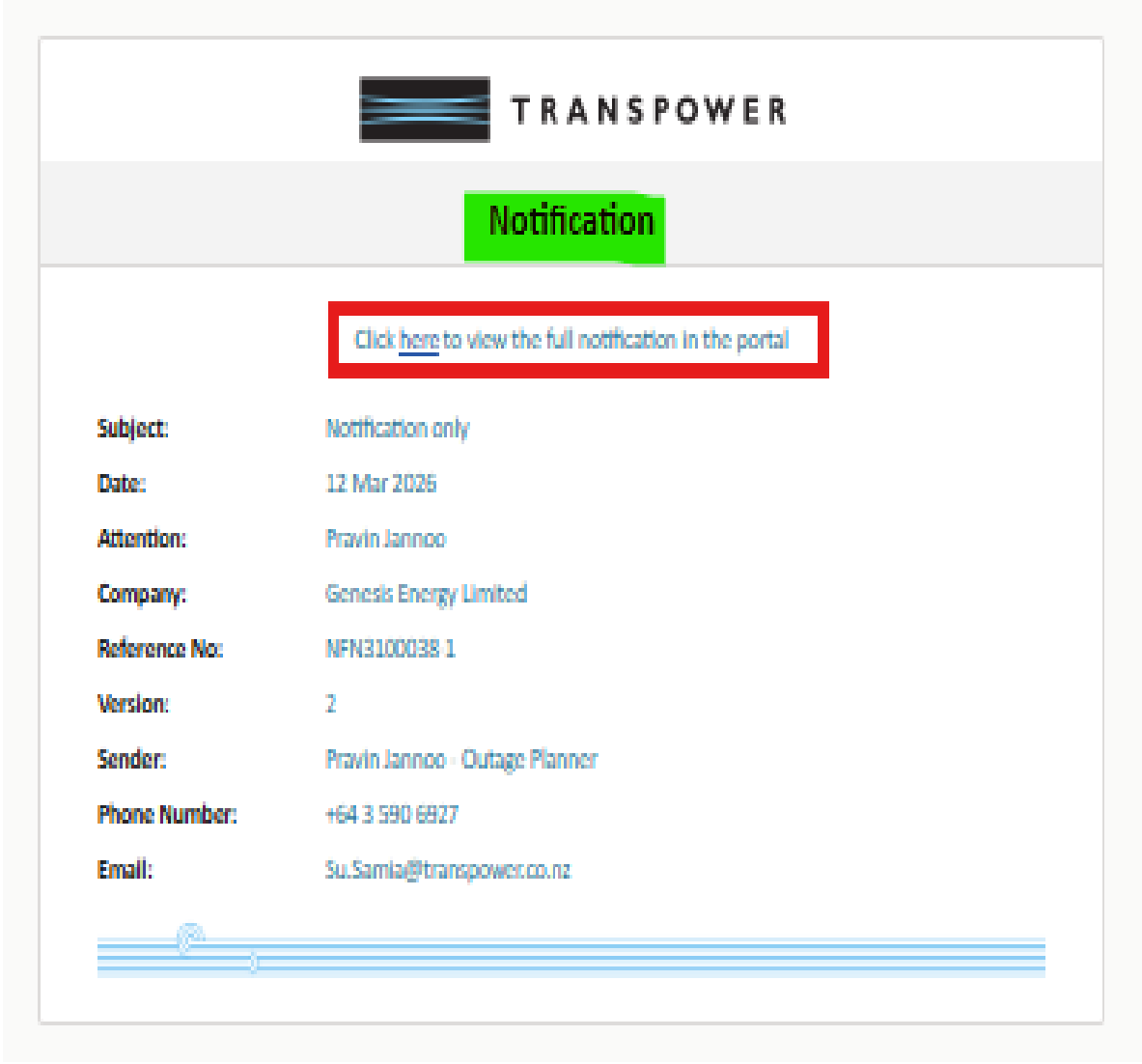
- reduction in expected unserved energy from the likelihood that future outages might cause loss, or arising from the outage itself
- reduction in maintenance, capital, refurbishment costs and operating costs resulting from the outage; reduction in fuel costs incurred by a generator which are likely to arise during or after the outage and as a result of the outage.
- Any relevant matter in clause 12.43(1)(a)(iv) and (b)(iv) of the Electricity Industry Participation Code 2010 where the matter referred to in those clauses is a cost to any person who produces, transmits, retails or consumes electricity; other benefits Transpower reasonable considers relevant to persons who produce, transmit, retail or consume electricity.

If no representations on the proposed asset variation are received by Transpower, or agreement is reached with those who have made representations so that no change to the proposed asset variation is required, the variation will proceed as published by Transpower.

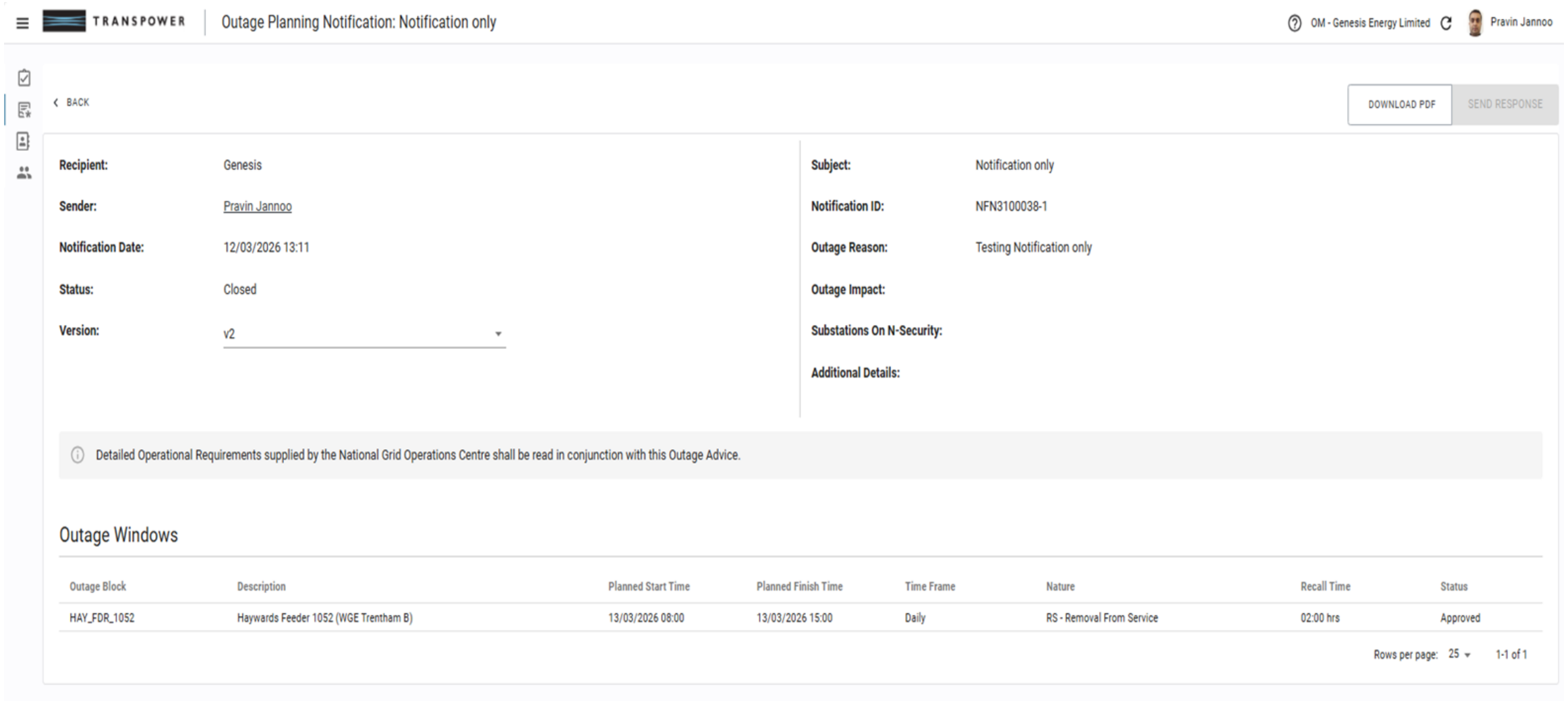
Notification

Outage details not in email body

Users will be prompt to go in the Customer Portal to view details



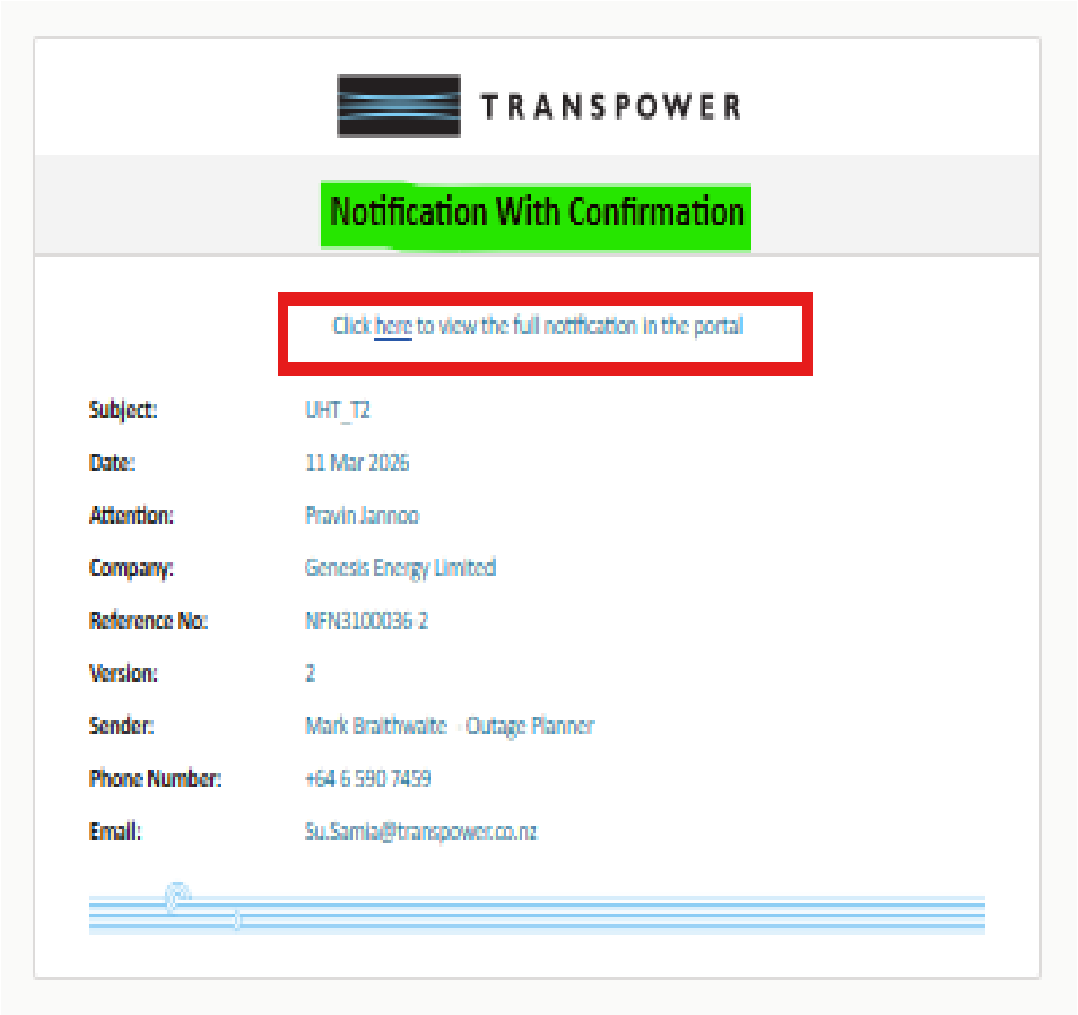
Notification



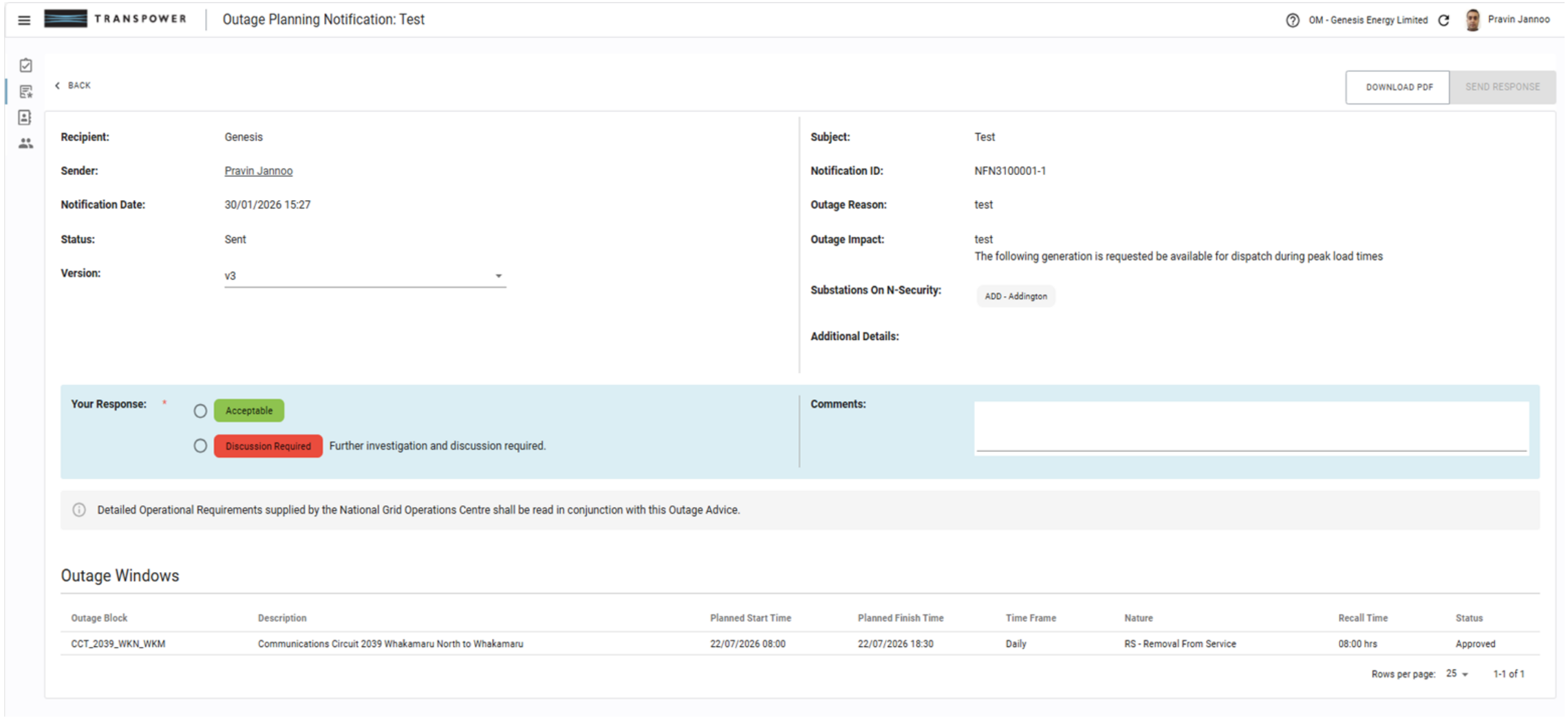
Notification with Confirmation

Outage details not in email body

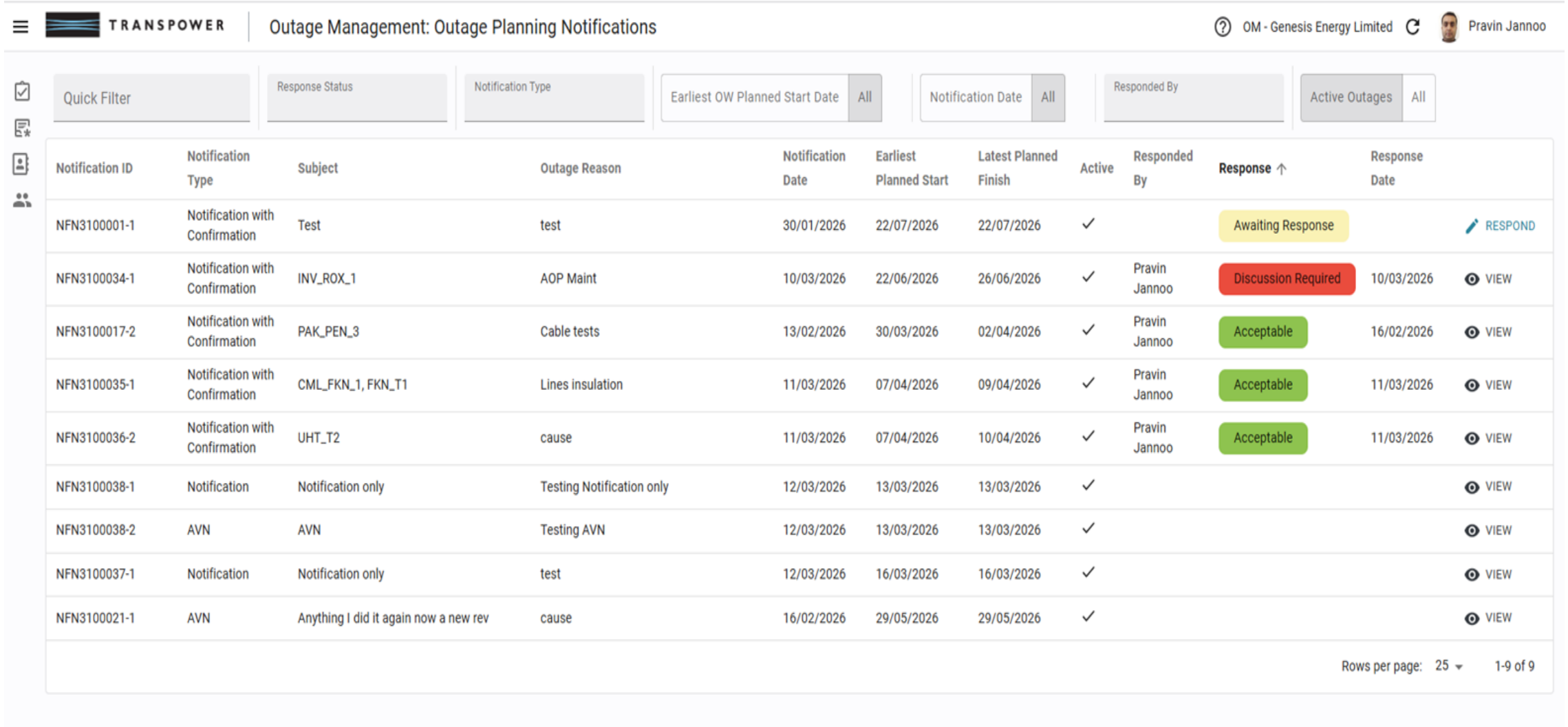
Users will be prompt to go in the Customer Portal to view details



Notification with Confirmation



Customer Portal View



Notification ID	Notification Type	Subject	Outage Reason	Notification Date	Earliest Planned Start	Latest Planned Finish	Active	Responded By	Response	Response Date	
NFN3100001-1	Notification with Confirmation	Test	test	30/01/2026	22/07/2026	22/07/2026	✓		Awaiting Response		RESPOND
NFN3100034-1	Notification with Confirmation	INV_ROX_1	AOP Maint	10/03/2026	22/06/2026	26/06/2026	✓	Pravin Jannoo	Discussion Required	10/03/2026	VIEW
NFN3100017-2	Notification with Confirmation	PAK_PEN_3	Cable tests	13/02/2026	30/03/2026	02/04/2026	✓	Pravin Jannoo	Acceptable	16/02/2026	VIEW
NFN3100035-1	Notification with Confirmation	CML_FKN_1, FKN_T1	Lines insulation	11/03/2026	07/04/2026	09/04/2026	✓	Pravin Jannoo	Acceptable	11/03/2026	VIEW
NFN3100036-2	Notification with Confirmation	UHT_T2	cause	11/03/2026	07/04/2026	10/04/2026	✓	Pravin Jannoo	Acceptable	11/03/2026	VIEW
NFN3100038-1	Notification	Notification only	Testing Notification only	12/03/2026	13/03/2026	13/03/2026	✓				VIEW
NFN3100038-2	AVN	AVN	Testing AVN	12/03/2026	13/03/2026	13/03/2026	✓				VIEW
NFN3100037-1	Notification	Notification only	test	12/03/2026	16/03/2026	16/03/2026	✓				VIEW
NFN3100021-1	AVN	Anything I did it again now a new rev	cause	16/02/2026	29/05/2026	29/05/2026	✓				VIEW

Outage Planning Policy and Outage Assessments

Mark Gilchrist

System Security Manager

Outage Planning Policy

The policy clarifies how, in our dual roles as System Operator and Grid Owner, we will meet our obligations around outage planning, coordination and assessment.

It draws on our Code obligations as Grid Owner and System Operator:

- The obligations Grid Owner has when planning outages
- The obligations the System Operator has when assessing outages and notifying interested parties.

This policy does not cover the additional Grid Owner obligations described in the Outage Protocol.

Outage Planning Policy Summary

Principles	Responsibilities
When planning outages	
1. Consider concurrency of outages	**Asset owners** endeavour to avoid concurrencies and timing that cause security concerns **System operator** identifies problems and alternative options **Asset owners** decide whether to move outages
2. Consider timing of outages	
When asset owners unable or unwilling to move outages that have potential to create a security concern	
3. Consider costs and benefits of outages	**Grid owner** considers costs and benefits of its outages. **System operator** identifies mitigations & considers costs/benefits to ensure cost-effective option is selected.
4. Identify potential impacts	**System operator** identifies potential impacts and publishes to industry as required.
Short notice outages which potentially cause a security concern	
5. Consider the notification period	**System operator** identifies potential impacts and publishes to industry as required.

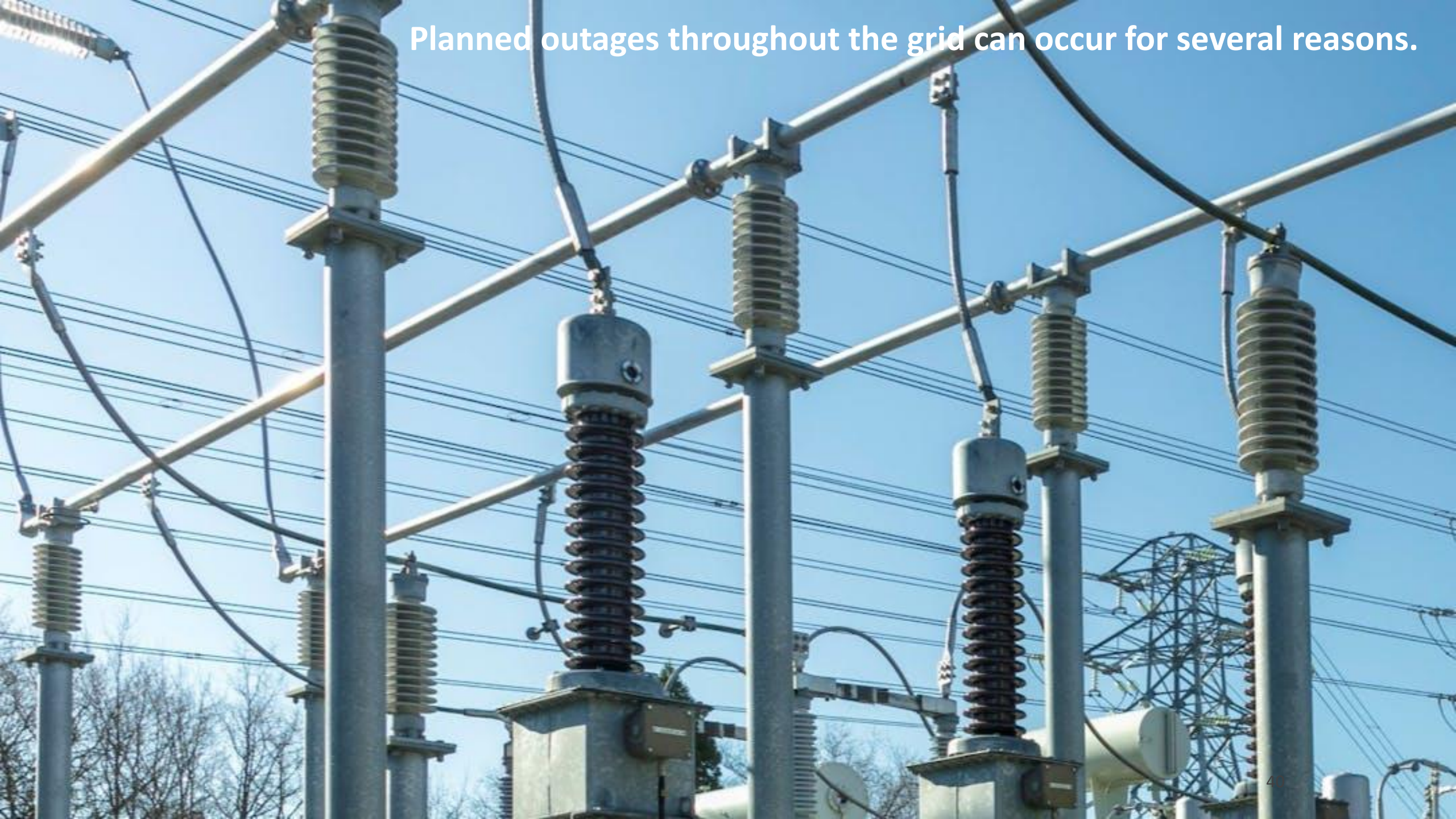
Roles of Industry Participants

System Operator:

- Assesses all asset owner outages to identify security concerns,
- Identifies how the outages may be better planned to avoid security concerns
- Identifies ways to mitigate remaining security concerns
- Identifies the potential impacts should the identified security concerns be present in

Asset Owner (incl the Grid Owner):

- Must notify the system operator of outages that have the potential to impact system security (this is generally coordinated through the Planned Outage Coordination Process (POCP))
- Must endeavour to avoid security concerns, consider the impacts of their outages and possible conflicts with other outages
- Must endeavour to make changes where the system operator identifies security concerns, but
- Ultimately retain discretion around their outages


Planned outages throughout the grid can occur for several reasons.

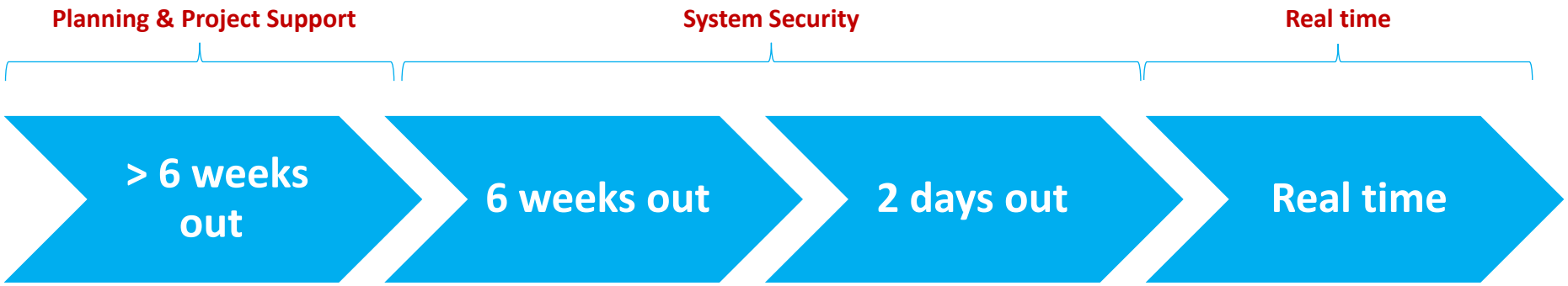
Purpose of outage assessments

Outage assessments determine whether any proposed outages introduce risks to **system security**.

Planning ahead - What would happen if the planned outage went ahead and then an unplanned outage happened?

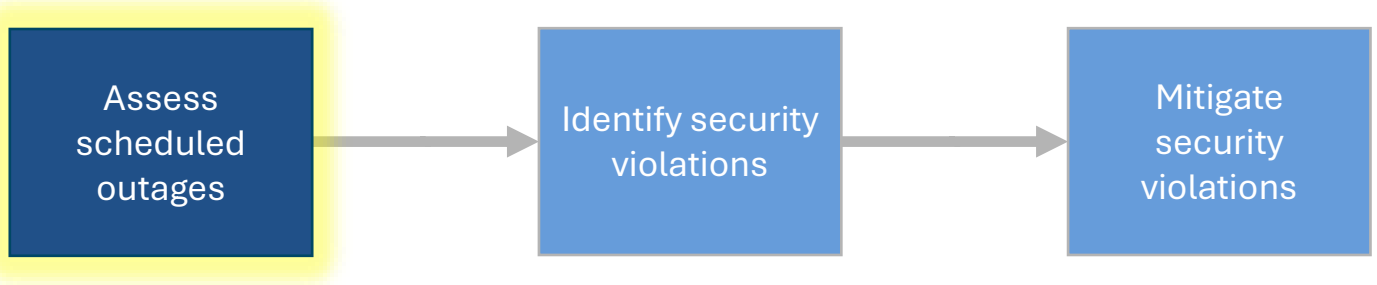
If we identify a risk, we develop solutions to ensure outages can proceed safely and maintain **system security**.

Outage Assessment Timeline



Developing mitigation solutions well before outages occur in real time.

The System Operator's Outage Assessment Process



We begin by **gathering information:**

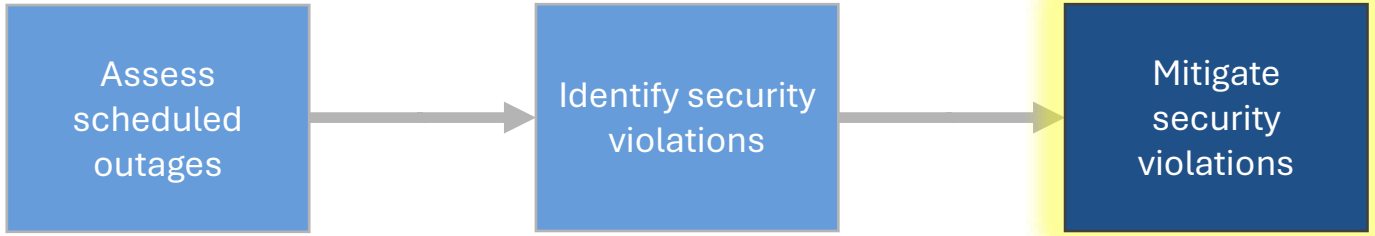
- Why is the outage needed?
- What equipment is affected?
- When is the outage occurring?
- Are there any other concurrent outages?

The System Operator's Outage Assessment Process

- **Conducting a power flow analysis**
  - Identifying security violations
    - During steady-state (pre-contingently)
    - Caused by a contingent event (post-contingently)

  - Types of security violations
    - Thermal violations (Overloading assets)
    - Voltage violations (Non-compliant voltages)
    - Voltage instability (Cascading failure)

The System Operator's Outage Assessment Process



- Were there any security violations identified?
- **No**. System Operator advises the Grid Owner that the outage can proceed without any mitigation required.
- **Yes**. Mitigation required.

- Methods of mitigating security violations:

1. Separate and/or reschedule outages
2. Special Protection Schemes (SPS)
3. Request generation agreements
4. Request load management
5. Implement a system split

- System Operator advises the Grid Owner about mitigation options.

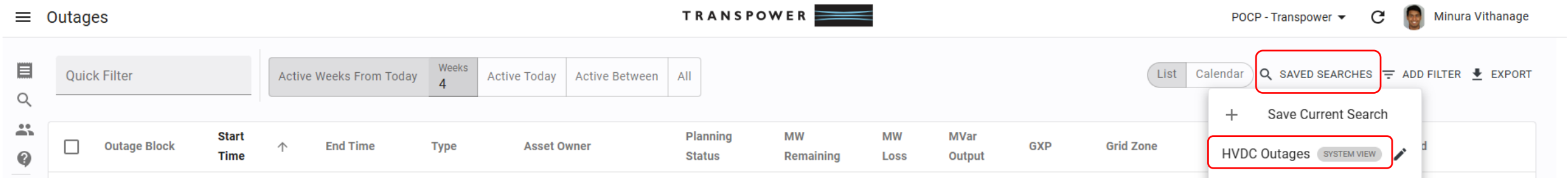
System Views in POCP

Minura Vithanage

Planning and Project Support Manager

New functionality in POCP

- Allows Transpower POCP admins to set system wide Saved Searches
- System Views enable users to easily find key projects in POCP, e.g upcoming HVDC outages
- System Views will appear under the "Saved Searches"
- These a viewable by all POCP users

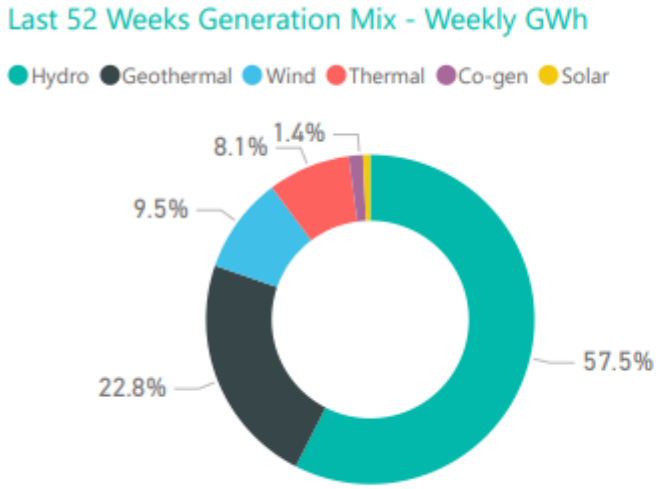


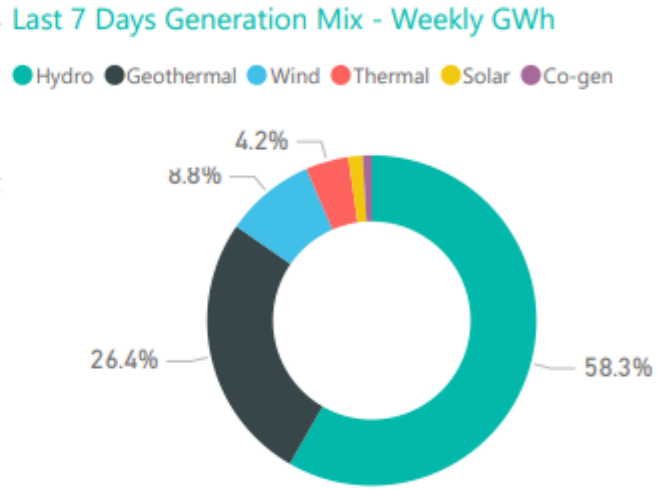
Managing lower South Island low hydrology

Mark Gilchrist

System Security Manager

Background

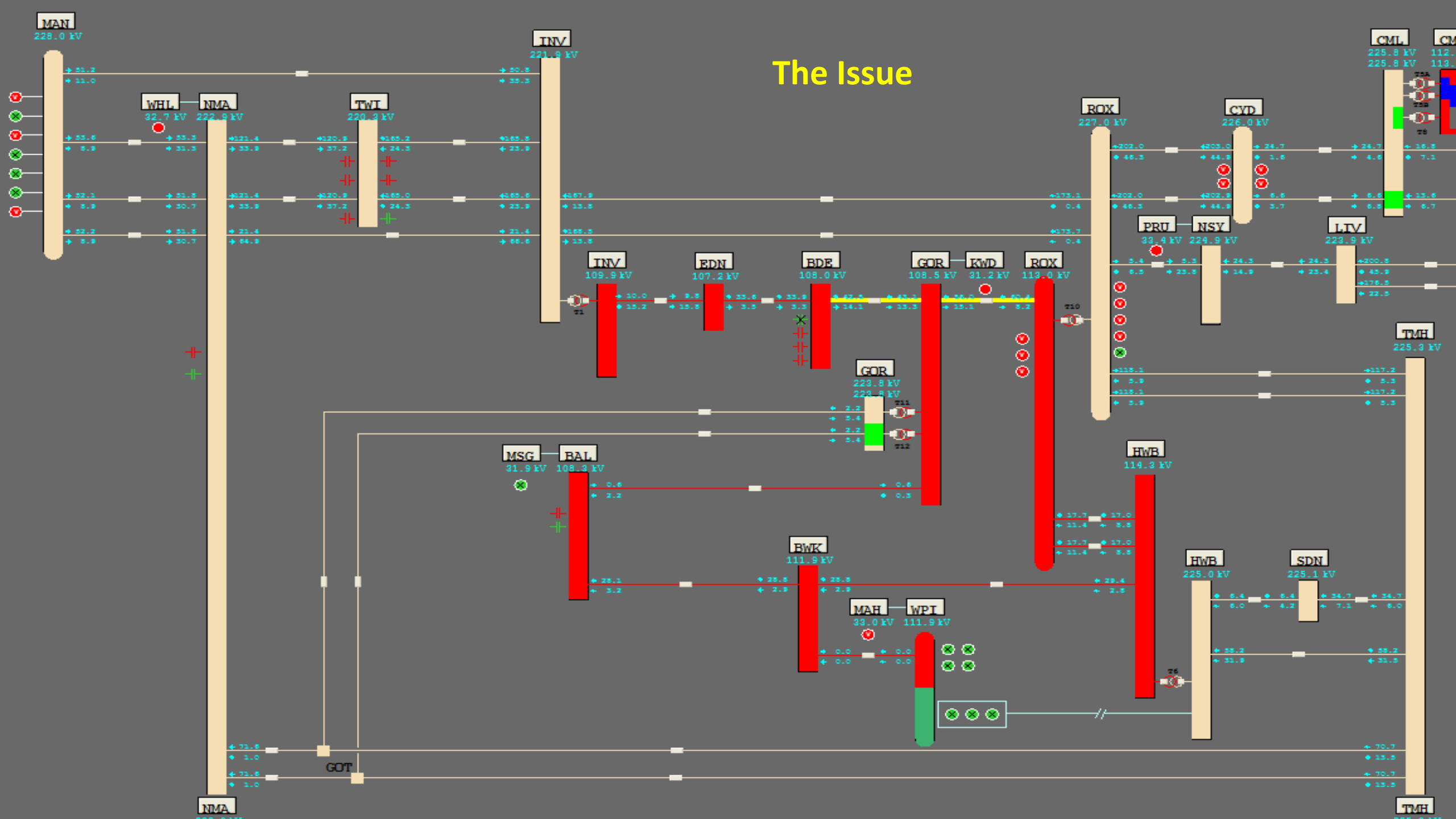


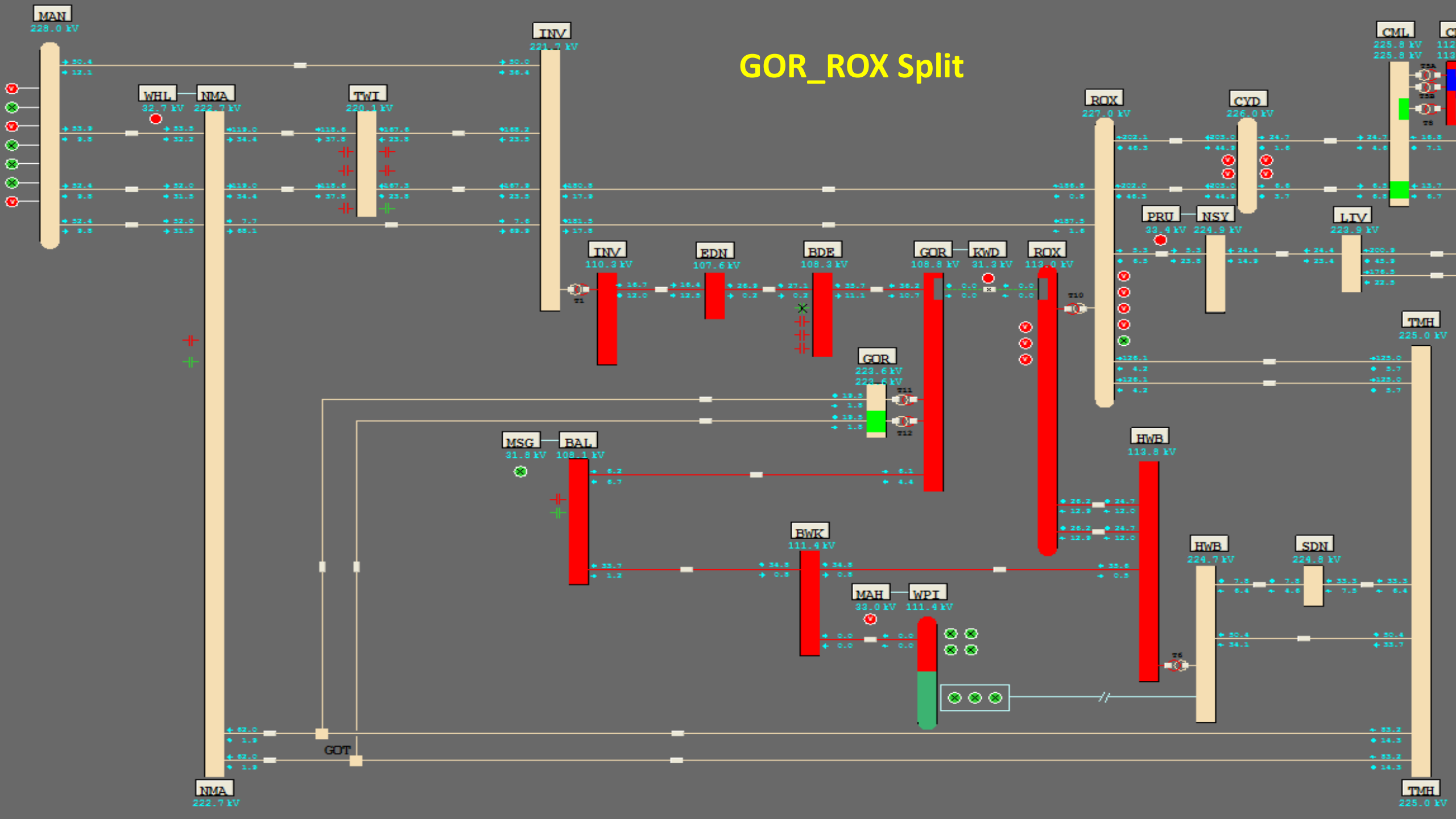


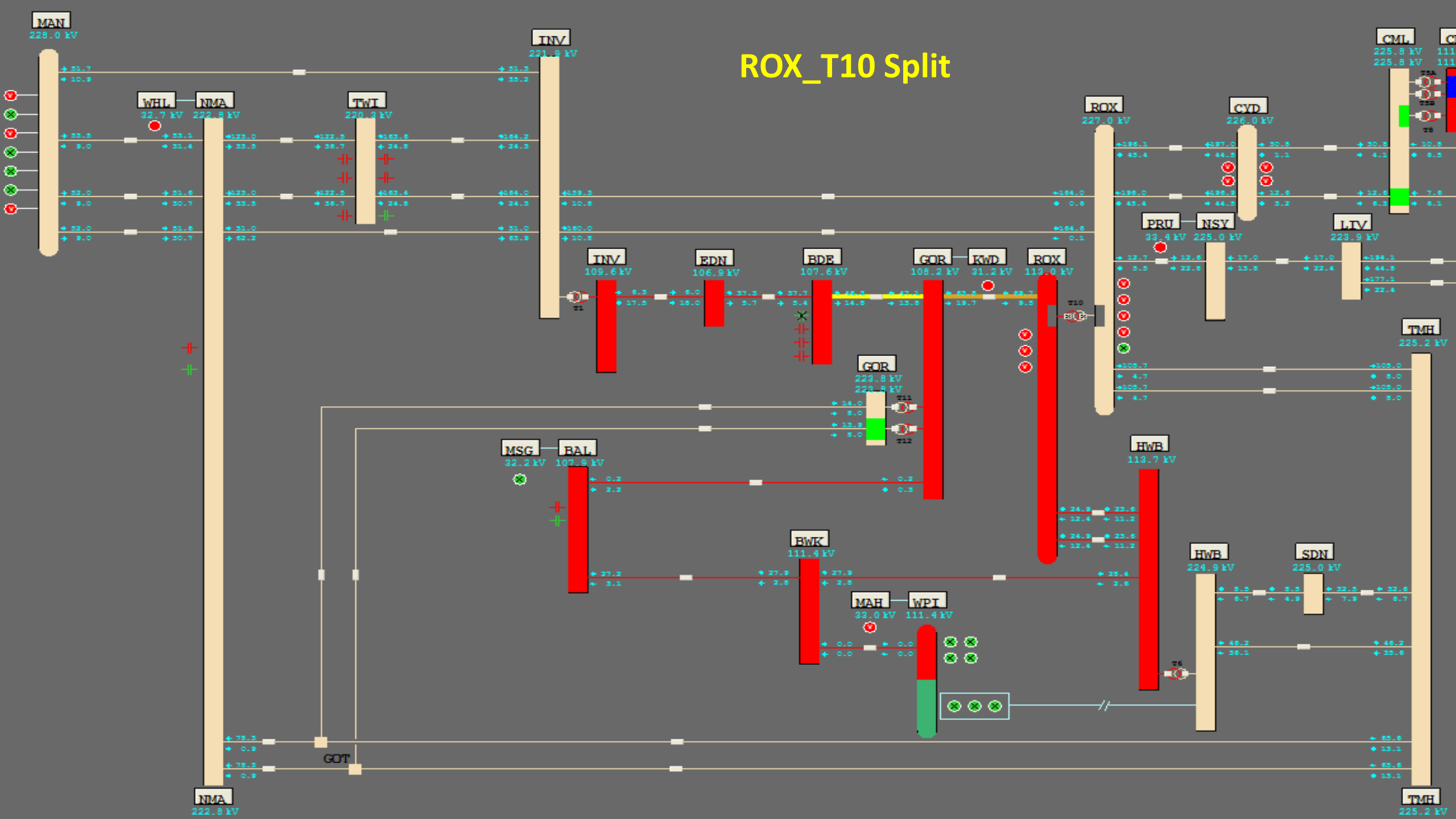
Market Operations Weekly Report – 1 March 2026

History:

- Hydro generation makes up a significant proportion of New Zealand's generation supply under normal circumstances.
- In 2022 and in 2025 Waiau hydro storage in the lower South Island was very low.
- On both occasions the System Operator went through the time consuming process of requesting a semi-permanent bus split at Gore Substation.
- In 2025 load was added at Edendale as Frontera had converted to one electric boiler
- The MW flow is south towards the Tiwai (575MW) load
- There are thermal or voltage stability issues in GZ14


The Issue
MAN
228.0 kV
INV
221.8 kV
WHL
32.7 kV
NMA
222.9 kV
TWI
220.2 kV
ROX
227.0 kV
CYD
226.0 kV
CML
225.8 kV
225.8 kV
PRU
33.4 kV
NSY
224.9 kV
LTV
223.9 kV
INV
109.9 kV
EDN
107.2 kV
BDE
108.0 kV
GOR
108.5 kV
KWD
31.2 kV
ROX
113.0 kV
GOR
223.8 kV
TMH
225.3 kV
MSG
31.9 kV
BAL
108.2 kV
HWB
114.3 kV
BWK
111.9 kV
HWB
225.0 kV
SDN
225.1 kV
MAH
33.0 kV
WPT
111.9 kV
GOT
NMA
TMH


GOR_ROX Split
MAN
228.0 kV
INV
221.7 kV
WHL
32.7 kV
NMA
222.7 kV
TWI
220.1 kV
ROX
227.0 kV
CYD
226.0 kV
CML
225.8 kV
225.8 kV
PRU
33.4 kV
NSY
224.9 kV
LTV
223.9 kV
INV
110.3 kV
EDN
107.6 kV
BDE
108.3 kV
GOR
108.8 kV
KWD
31.3 kV
ROX
113.0 kV
GOR
223.6 kV
223.6 kV
TMH
225.0 kV
MSG
31.8 kV
BAL
108.1 kV
HWB
113.8 kV
BWK
111.4 kV
HWB
224.7 kV
SDN
224.8 kV
MAH
33.0 kV
WPI
111.4 kV
GOT
NMA
222.7 kV
TMH
225.0 kV


ROX_T10 Split
MAN
228.0 kV
INV
221.9 kV
WHL
32.7 kV
NMA
222.8 kV
TWL
220.3 kV
ROX
227.0 kV
CYD
226.0 kV
CML
225.8 kV
PRU
33.4 kV
NSX
225.0 kV
LTV
223.9 kV
INV
109.6 kV
EDN
106.9 kV
BDE
107.6 kV
GOR
108.2 kV
KWD
31.2 kV
ROX
113.0 kV
T10
TMH
225.2 kV
GOR
223.8 kV
T11
T12
MSG
32.2 kV
BAL
107.8 kV
HWB
113.7 kV
BWK
111.4 kV
HWB
224.9 kV
SDN
225.0 kV
MAH
33.0 kV
WPI
111.4 kV
T6
GOT
NMA
222.8 kV
TMH
225.2 kV

New Grid Owner Offer

Offer:

A split on the Gore Bus. (On either Disconnector 557 or 567)

The offer can be used at the SO's discretion:

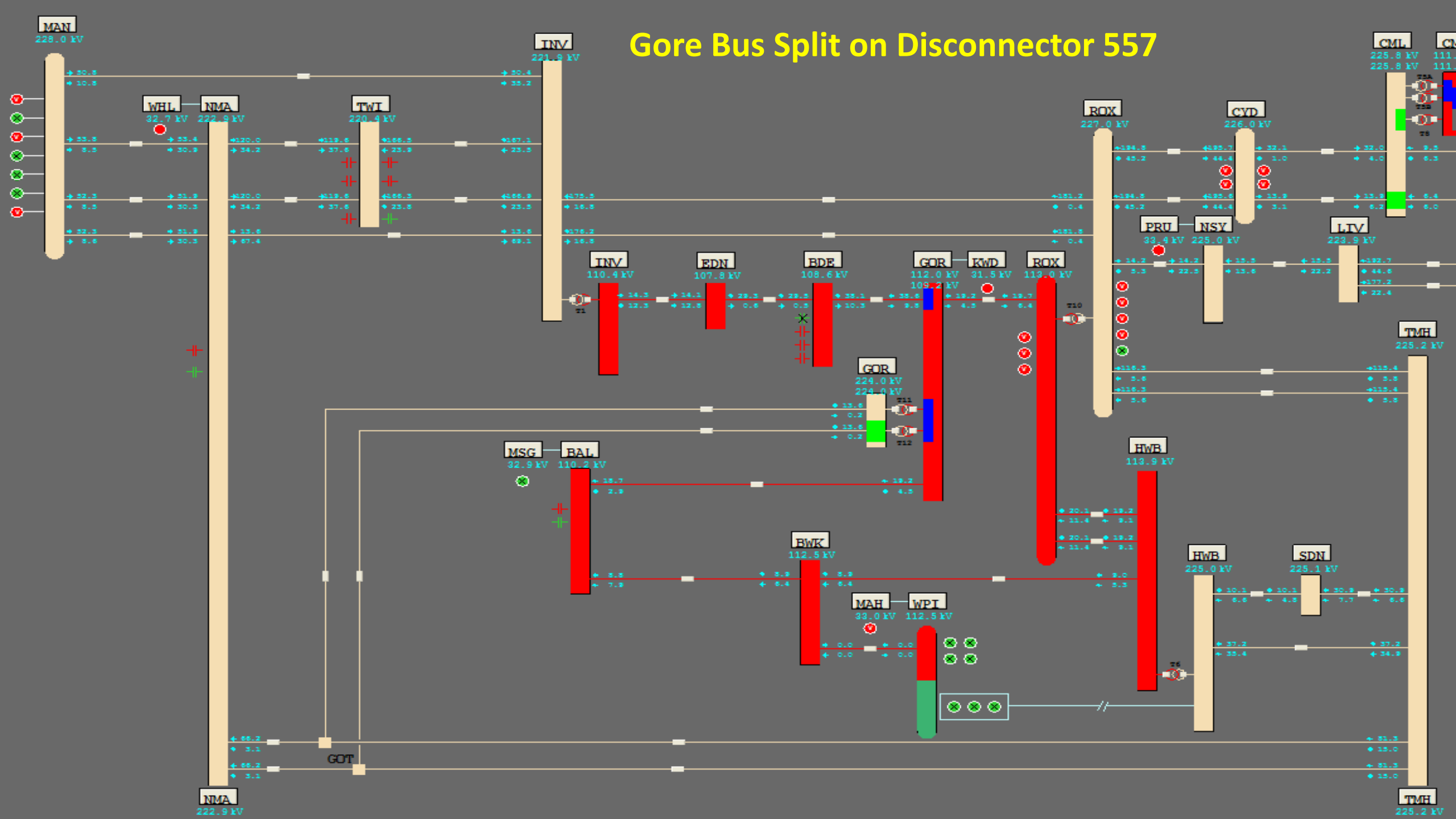
- The split can be used under dry year or low Waiau storage inflow conditions
- The GO is notified and retains visibility when the split is put in place
- Protection and Grid running arrangement is suitable to allow the bus split.
- The arrangement is expected to be temporary and will be reviewed once the SPS solution currently in design (GOR-ROX COPS and BAL-BWK COPS) becomes operational (expected within ~18 months)

Advantage:

- Separates 110kV network generation.

Disadvantage:

- This split requires manual switching and once implemented would be semi-permanent


Gore Bus Split on Disconnector 557
MAN
228.0 kV
INV
WHL
32.7 kV
NMA
222.9 kV
TWI
220.4 kV
ROX
227.0 kV
CYD
226.0 kV
CML
225.8 kV
225.8 kV
PRU
33.4 kV
NSY
225.0 kV
LIV
223.9 kV
INV
110.4 kV
EDN
107.8 kV
BDE
108.6 kV
GOR
112.0 kV
109.2 kV
KWD
31.5 kV
ROX
113.0 kV
GOR
224.0 kV
224.0 kV
TMH
225.2 kV
MSG
32.9 kV
BAL
110.2 kV
HWB
113.9 kV
BWK
112.5 kV
HWB
225.0 kV
SDN
225.1 kV
MAH
33.0 kV
WPI
112.5 kV
GOT
NMA
222.9 kV
TMH
225.2 kV

Close

David Katz

Head of Operations Planning

Closing **Karakia**

Unuhia, unuhia,
Unuhia ki te uru tapu nui
Kia wātea, kia māmā, te ngākau,
Te tinana, te wairua, i te ara tangata
Koia rā e Rongo, whakairia ake ki runga
Kia tina! Tina! Hui e! Tāiki e!

Translation

Draw on, draw on
draw on the supreme sacredness
to clear, to free the heart,
the body and spirit of humankind
That is Rongo suspended high above us
Draw together! Affirm!

Thank you

TRANSPOWER.CO.NZ